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Open linked data and ontologies in mathematics education

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Abstract

© 2018 CEUR-WS. All rights reserved. A review of the application of ontologies and open related data in educational activities is given. The models of semantic representation of mathematical knowledge are described and the approach to their application in mathematical education is offered. Methods for constructing a digital mathematical learning environment based on the ontological approach and models of Linked Open Data (LOD) are developed. For computer processing of educational texts, semantic annotation of teaching materials, marking of texts by concepts from ontology, links to formulas from the repository of formulas with the help of a specialized search module was developed. Automated methods of complex assimilation of mathematical knowledge for various categories of students, including the possibility of automated testing, as well as software tools that implement these methods are proposed. The development of these methods led to the need to create a new educational mathematical ontology, the prototype of which is presented in the work. OntoMathEdu ontology was designed on the basis of OntoMathPRO ontology developed earlier. A new conceptualization has been created, reflecting the conceptual system of mathematics, which corresponds to school education. Adaptation of professional terminology to educational activity, in particular, to the language of school mathematics was carried out. OntoMathEdu added a relationship that reflects the didactic relationship between concepts. Ontology concepts contain their names in English, Russian and Tatar, as well as basic definitions, relationships with other concepts of ontology (associative relations), and links to concepts from external data sets. Ontology OntoMathEdu is built on a set of basic OntoMathPRO ontology relationships, such as the taxonomic relationship (ISA); the relation between the mathematical object and the field of mathematics; the relation between mathematical objects is "determined by means of"; the relationship between the task and the method of solving it; A new set of didactic relations was also introduced.

Keywords

Communication technologies, Mathematics education, Ontologies, Open linked data, Semantic information

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